INNOVATIVE TECHNOLOGICA
METHODICAL RESEARCH JOURNAL
ISSN: 2776-0987 Volume 3, Issue 11 Nov. 2022

DEVELOPMENT OF A RESOURCE-EFFICIENT CONSTRUCTION OF A COTTON SEPARATOR

Shohida Khusanova
Lecturer, Fergana Polytechnic Institute, Fergana, Uzbekistan
E-mail: sh.khusanova@ferpi.uz

Ergashev Yuldashali
Lecturer, Fergana Polytechnic Institute, Fergana, Uzbekistan

Abduqaxorov Abdusattor
Master's Degree Student, Fergana Polytechnic Institute, Fergana, Uzbekistan

Abstract
The article analyzed the technological characteristics, performance, and advantages of the models of cotton separators currently used in cotton ginning enterprises, and made suggestions for the development of its resource-saving design.

Keywords: continuous technological process, cotton cleaning plant, transportation conveyors, suction devices.

Introduction

The reception and storage of seed cotton is a continuous technological process, and the transfer of raw materials and finished products to the departments and territories of the cotton ginning enterprise requires a large number of different transport vehicles and special mechanized devices that require a lot of heavy work. and equipment is used [1-4].

Complex mechanization of these works is much more difficult due to the large volume of raw materials and finished products. One of the main features of cotton ginning plants is a large amount of load in a continuous technological process [5-9]. Due to the large area of the cotton gin, the distance between the sections is 50 to 120 meters, sometimes more. In the past, in the area of cotton factories, cotton raw materials were transported from department to department by workers in sacks on their shoulders. Nowadays, with the increasing productivity of cotton ginning enterprises, this method is no longer acceptable, mainly labour-intensive work is done with the help of various types of mechanization. Two methods of transporting cotton raw materials are known:

– Mechanical method. Mechanical transportation is carried out using conveyors. They consume less energy, but it is more difficult to move them from one place to another, they have a low level of durability and a large consumption of metal.
– Pneumatic method. The pneumatic method is one of the main forms of transportation of cotton raw materials from warehouses to production and from one department to another.

Pneumatic transport is carried out at the expense of airflow. Pneumatic conveying is reliable in operation, the cotton loss is low during transportation, and maintenance and repair are convenient. But from the point of view of energy consumption, air consumption here is significant.

Vehicles must meet the following requirements:

a) Ensuring sufficient productivity of the cotton ginning enterprise (the productivity should not be less than 12 t/h);
b) Ability to move at a high level;
c) High level of reliability during operation;
d) Low energy consumption during operation.

The method of mechanical transportation (with the help of belt conveyors) ensures the fulfilment of the requirements of point 4, therefore, this type of transportation is purposefully used for the inter-departmental transportation of seeded cotton in the production zone of the cotton ginning enterprise. The pneumatic method ensures the fulfilment of the requirements of the first three points, this method is purposely installed in the raw material area of the cotton ginning plant [10-14].

Pneumatic vehicles are divided into intra-enterprise, inter-departmental and intra-departmental types depending on the place of installation. The way it works is based on the ability of the air, which depends on the state of movement of the air in the pipes and the cotton during the mixing.

The air pressure at the entrance and end of the pneumatic conveying device is different. This method of transportation is the most optimal when the suction devices in cotton ginning plant transport fibre from the battery of sawing gins, and also when transporting fluff from lint separators to condensers (Fig. 1).

INNOVATIVE TECHNOLOGICA
METHODICAL RESEARCH JOURNAL
ISSN: 2776-0987 Volume 3, Issue 11 Nov. 2022

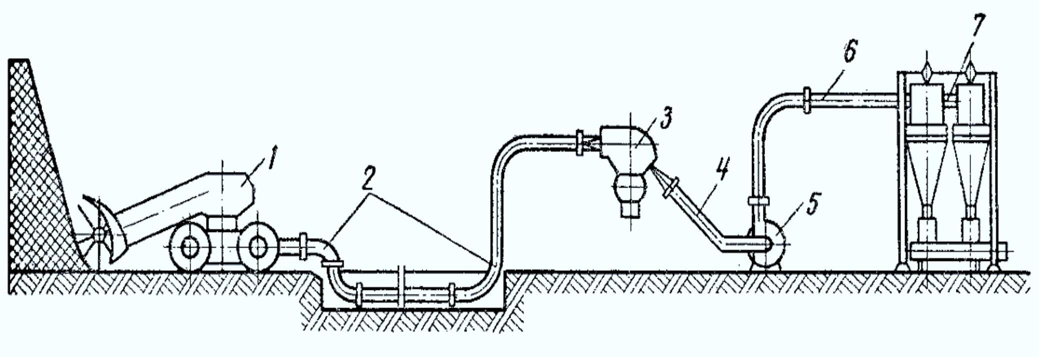

Figure 1. A drawing of a pneumatic transport device in suction view.

The main elements of the suction-type pneumatic transport device are:
1 – cotton riot picker (RBD); 2 – Suction main pipe; 3 – separator; 4 – intake air duct; 5 - centrifugal fan; 6 – air outlet, air dust; 7 - dust collecting devices.

The working pipeline consists of the main section and connecting joints. Pipes in the main section are made of 2-3 mm steel sheets of welded construction with a diameter of 400-500 mm. The working length or radius of movement of the pipeline in a cotton ginning enterprise that prepares a large amount of seeded cotton and has a preparation facility can be 200÷250 meters. Main portable pipes are placed underground at a depth of 600÷700 mm or on trestles [15-18]. At certain intervals along the entire length of the pipelines, for connecting a separate pipeline to each warehouse, special pipes (teaches) are installed on the ground, as well as monitoring and connection wells. Portable pipes are placed on the ground.

The equipment that supplies the entire area of the cotton gin with seed cotton is called a separator (Fig. 2).

The main task of the separators is to separate the seed cotton from the air, which is absorbed by the air. The separator works based on the decreasing pressure of the air effectively sucked into the working chamber. This type of transport is widely used in all-cotton ginning enterprises.

The CC-15 scraper separator consists of two mesh barrier working chambers: (1) for cotton and (2) for air. In the cotton section, the section for cleaning the seeded cotton from the mesh screen (5) has a guide (3) and a scraper (4) on the sides, with the help of which the cotton is directed to the vacuum valve (6). The vacuum-valve separator is designed to separate seeded cotton from the working chamber. The air outlet, side and conical sides of the separator chamber are covered with a mesh surface. A certain part of the seeded cotton entering the

INNOVATIVE TECHNOLOGICA
METHODICAL RESEARCH JOURNAL
ISSN: 2776-0987 Volume 3, Issue 11 Nov. 2022

separator working chamber (1) with the airflow falls into the vacuum valve (6) due to the decrease in the speed of the airflow, and a certain amount of cotton sticks stuck to the mesh surface by being absorbed by the air. With the help of "ich" (4), it is squeezed from the mesh surface and transferred to the vacuum valve.

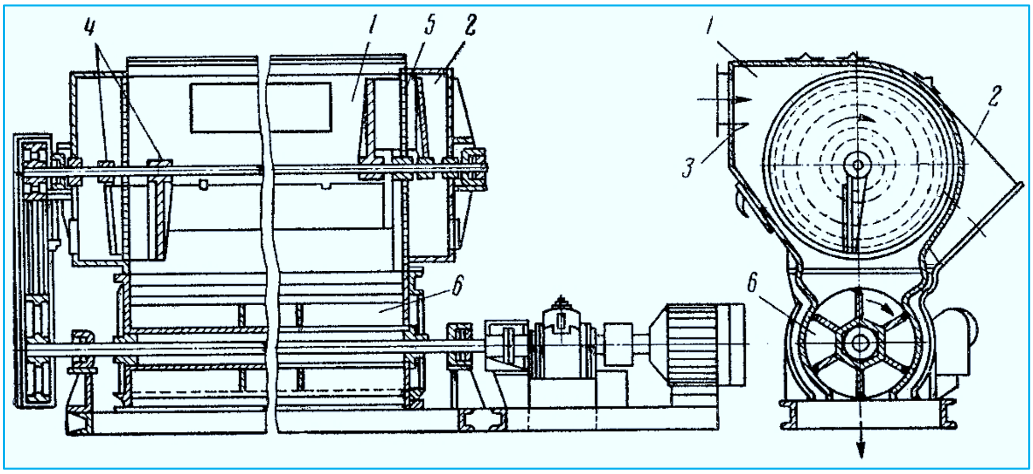

Figure 2. CC-15 scraper separator

Table 1. Technical indicators of separators

Separator brand	*Productivity*	*Cleaning efficiency*	*Required power*	*Radius of movement*
SS-15	up to 15 t/c	8÷10%	7 kW	120÷150 t
SX	20÷22 t/s	12÷15%	9.7 kW	180÷200 t

The operation procedure of pneumatic transport is based on the movement of seed cotton coming with the airflow at a certain speed (V). Therefore, the mixing of seed cotton inside the pipeline depends on the effect of air pressure.

The air velocity (V_h) at the place of transfer of seed cotton into the pipeline can be found using the following formula:

$$V_h = 8,5G^{0,4} \text{ m/s} \quad (1)$$

Air consumption (Q) absorbed in the head of the pipe is found from the following formula:

$$Q = \frac{\pi d^2}{4} \times V_h \, (\text{m}^3/\text{s}) \quad (2)$$

where: d is the diameter of the pipe, m;

G - work performance of the separator, t/s;

V_h – speed of air in the pipe, m/s;

8.5 is a coefficient that takes into account air friction on the pipe walls and pressure reduction in the pipe.

Knowing the efficiency of the separator for seeded cotton and the pressure of the pipeline in the transport system, it is possible to determine the radius of movement of the pneumatic transport device in the field:

$$R = H \times \eta \times \Psi \left[1 + \frac{\mu \left(\frac{1100}{V_h^3} \right) \times \kappa}{Q^2} \right] (m) \qquad (3)$$

here, μ - weight concentration of the mixture.

$$\mu = \frac{G}{5,4 \times Q} \qquad (4)$$

κ - parabola coefficient for new pipes, $\kappa = 0,111$;

η - useful efficiency of the device $\eta = 0,5$

N - air pressure generated in the fan; mm. water.

Ψ - the coefficient taking into account the movement of seed cotton in the pipe (when G=5÷10 t/s, Ψ =0.6; When G>10 t/s, Ψ =0.5)

References

1. Salimov, O. A., Khusanova, S. A., Salimov, M., & Rahimjonov, A. R. (2022). Study of Factors Affecting the Quality of Raw Cotton During Storage and Processing. *CENTRAL ASIAN JOURNAL OF THEORETICAL & APPLIED SCIENCES*, *3*(3), 40-46.
2. Khusanova, S., Esonzoda, S., Mirzayev, B., & Khakimov, I. (2021). Methods of control of air pressure in the working chamber of arrali demon machine. *International Engineering Journal For Research & Development*, *6*(3), 5-5.
3. Ergashev, Y., Xusanova, S., & Axmadjonov, D. (2022). Analysis of the fiber quality of cotton varieties grown by region. *Gospodarka i Innowacje.*, *21*, 242-244.
4. Adxamovna, B. G. (2022). Improving food safety mechanisms in Uzbekistan. *World Economics and Finance Bulletin*, *15*, 135-139.
5. Axmedov, M. X., Tuychiev, T. O., Ismoilov, A. A., & Xusanova, S. A. (2021). Algorithm of the estimation of the moving the raw cotton on surfaces of the

pallet of the mechanism of the presenting ginning machines. *Scientific-technical journal*, *4*(3), 69-74.
6. Nematova, M., & Rasulova, F. (2022). Foreign experience in improving the efficiency of processes of removing cotton fiber from saw teeth. *Gospodarka i Innowacje.*, *25*, 118-124.
7. Mahmudjonova, F., Anvarova, D., & Toirjonova, G. (2022). Determination of the forces of interaction of the raw material with the saw cylinder. *Gospodarka i Innowacje.*, *25*, 113-117.
8. Adxamovna, B. G. (2021). Directions for Improving the Organizational and Economic Mechanism of Food Industry Management in the Digital Economy. *Central Asian journal of innovations on tourism management and finance*, *2*(12), 16-21.
9. Sh, K., Sirojiddinova, M., & Gofurjonova, D. (2022). Problems of fiber removal processes from saw teeth in fiber separation. *Gospodarka i Innowacje.*, *25*, 125-128.
10. Salimov, A., Khusanova, S., Salimov, O., Toshtemirov, Q., Yakubov, N., & Rakhimjanov, A. (2022). Research of The Process of Preparation and Storage of Raw Cotton. *Journal of Optoelectronics Laser*, *41*(7), 612-618.
11. Ulugboboyeva, M. M., & Tursunova, X. S. (2021). Ways to solve problems in the production of knit wear. *Asian Journal of Multidimensional Research*, *10*(9), 29-33.
12. Tursunova, X. S. (2021). Study of Preliminary Design Work for the Selection and Manufacture of Fabrics Based on the Analysis of School-Age Girls' Clothing. *ISJ Theoretical & Applied Science*, *11*(103), 568-572.
13. Dekhkanov, S. A. (2020). Перспективы развития внешне экономической деятельности объединенных арабских эмиратов и республики узбекистан: современные реалии, инновации и стратегии развития. *Theoretical & Applied Science*, (4), 926-929.
14. Raxmatovna, M. S. (2022). Analysis of women's clothes sewing-a study to develop a norm of time spent on the technological process of knitting production. *International Journal of Advance Scientific Research*, *2*(03), 16-21.
15. Maripdjanovna, U. B. M., & Xilola, T. (2022). Problems of automation of technological processes of sewing manufacturing. *Galaxy International Interdisciplinary Research Journal*, *10*(1), 550-553.

16. Бердиева, З. М. (2020). Способы обучения учащихся решению химических задач. *Достижения науки и образования*, (6 (60)), 4-8.
17. Tursunova, K., & Fozilov, S. (2022). Research on the Development of Daily Clothing Sets for Teenage Girls from BI-Component Knitted Fabrics. *Periodica Journal of Modern Philosophy, Social Sciences and Humanities*, *12*, 26-28.
18. qizi Tursunova, X. S., & Berdiyeva, R. N. A. (2022). Teenage girls'range of modern dresseS. *Results of National Scientific Research International Journal*, *1*(7), 145-152.